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### CHANGE OF VEGETATION ON THE SOUTH TEXAS PRAIRIES.

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It is a matter of popular knowledge in south Texas that extensive regions which were formerly grassy, open prairies are now covered with a dense growth of mesquite (*Prosopis*), prickly-pear cactus (*Opuntia*), and many other shrubby plants of intermediate size. Testimony to this effect is definite and unanimous. It differs locally only in the number of years since the bushes began to grow—thirty years, or twenty, or ten—subsequent to the establishment of the grazing industry on a large scale, the annual burning of the grass by the cattlemen, and finally the fencing of the land for still more intensive grazing.

Many localities are only now being invaded by the woody vegetation. Very often the old mesquite pioneers, the scattered trees which made the "open mesquite country" of other decades, are still conspicuous among their much smaller progeny and the crowds of other camp-following species which now occupy the land to the almost complete exclusion of the grasses upon which the herds of former days were pastured. A new order of nature is at hand in south Texas. The change has come so gradually that even those who have the most intimate acquaintance with the facts have not appreciated their significance, much less published them abroad.

Before the prairies were grazed by cattle the luxuriant growths of grass could accumulate for several years until conditions were favorable for accidental fires to spread. With these large supplies of fuel the fires which swept over these prairies were very besoms of destruction not only for man and animals but for all shrubs and trees

which might have ventured out among the grass, and even for any trees or forests against which the burning wind might blow.

That such fires were evidently the cause of the former treeless condition of the southwestern prairies is also shown by the fact that trees are found in all situations which afford protection against fires. Along beaches and on naked sand dunes, in grassless river bottoms and abandoned channels of "slews," in deep swamps and in sterile rocky places the forest has maintained footholds. Nor is there any reason in the nature of the climate or the soil why trees should not thrive over the vast areas of open prairie land. Trees of many kinds have thriven well where planted in villages and about homesteads. In addition to the natural spread of the woody vegetation as soon as the fires cease.

Those who are acquainted only with northern regions of hills and valleys, heavy rains, and deep snows may find it difficult to believe that the burning of grass can destroy or prevent the growth of forests and keep vast regions in a treeless condition. One needs, perhaps, to have the mind prepared by actual observation of the destruction of forests by fires of grass. In humid countries dead grass is beaten down and decays during the next summer season. Forest fires in northern countries arise from accumulations of fallen leaves and other debris, but in the warmer parts of the world these conditions are generally reversed. The forests do not burn with their own fuel, but may be invaded and driven back by the adjacent grass. In this respect, as in several others, south Texas may be reckoned as a part of the Tropics, in spite of the occasional "northers" of the winter season, which carry the temperature below the freezing point and thus exclude all the tender tropical types of perennial plants.

The traveler in Mexico and Central America encounters many illustrations of the advantage enjoyed by grasses over other vegetation in the presence of fire. Large areas of land formerly cultivated by the native Indians remain barren of everything except the coarse grasses which afford the fuel of the fires that prevent the growth of trees and the renewing of the soil. In regions not subject to such fires the forest is rapidly renewed and the land can be cleared and planted again at intervals of a few years.

Even where the grass-grown land has not been cleared by man it is possible for wild grasses to drive back adjacent forests with the aid of fire. In this way a species of wire grass (*Epicampes*) is destroying forests of alders and pines on the upper slopes of the Vulkan de Agua in Guatemala. Before the access of fires this grass appears to have been confined to the crater and to the very dry upper slopes where the pine trees are small and scattering. Now that the belts of humid forests lower down have been broken by clearings the grass

has the assistance of fire and is destroying the larger growth with increasing rapidity.

There are no springs or streams on the upper slopes of the volcano, so that the grass is not pastured. Its long wiry stems and leaves accumulate until there are quantities of fuel sufficient to kill large trees and to drive back the forest for long distances at each conflagration.<sup>a</sup> The lower the grass comes the more luxuriant its growth and the more destructive the next fire. This will continue as long as the grass is ungrazed or care is not taken to burn it every year in order to prevent the accumulation of dangerous quantities of fuel.

Settlers in south Texas early adopted the practice of burning over the prairies every year: partly to protect their homes against the fires, partly to give their cattle readier access to the fresh growth of grass. The fires were often set near the coast, the strong breeze which blows in from the Gulf spreading the flames over many square miles. While the grass was still abundant these annual burnings were able to keep the woody vegetation well in check, though no longer able to drive back the forest or even to prevent a slow advance.

In spots where the grass is thin, seedling mesquites and oaks escape the flames and in a year or two begin to shade the ground and gain more protection against the dangerous proximity of the combustible grass: and even though the tops are killed by later fires the roots may send up sprouts again and again to improve every chance of becoming established and joining branches with near neighbors to increase the area of shade. The lessened quantity of grass also makes it impracticable to burn the prairies over in the summer, as was customary in former decades. Burning has now to be done in the winter when the grass is dry, but the young trees are then in a dormant condition and are much less injured by the fire than in the summer season of vegetative activity.<sup>b</sup>

In the region between Houston and Victoria large tracts are being occupied by "oak runners." Farther south, the mesquite usually held sway alone for a considerable period before the smaller and less hardy types were able to advance against the gradually weaker fires. With the building of barbed-wire fences and the provision of

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<sup>a</sup> The roots of this grass are well protected from the fire by masses of the closely packed stems. These tufts remain wet while everything else is thoroughly dried. Except in rainy weather no water can be obtained from the extremely coarse and loose volcanic ashes and rocks of which the upper parts of the mountain are composed. *Weldenia* and other native plants show striking adaptations for drought resistance. Even the alder has a remarkably thick, cheesy bark, which doubtless serves for the storage of additional supplies of water.

<sup>b</sup> It is also pointed out by Mr. Frederick V. Coville that the young woody plants must be able to make more rapid growth than formerly because of the reduced competition of the grasses for the moisture of the soil.

permanent supplies of water by wells and reservoirs the cattle were greatly increased. About a decade ago there was a series of very dry seasons when the cattle left little grass to burn, often none at all. This was a time of notable prosperity for the bushes and cacti. Through many square miles of the Rio Grande Valley, and doubtless in many other parts, the victory over the grass was complete and final. There has been no burning since, nor ever will be, unless the bushes grow thick and accumulate dry wood enough to furnish the fuel.

The mesquite alone worked little injury to the grazing industry, for the pods are relished by cattle and horses, supplementing the otherwise exclusive diet of grass and affording a reserve supply of food in dry seasons. When, however, the huisach (*Acacia farnesiana*) and smaller shrubs and cacti become numerous enough to kill out the grass, the pasturage rapidly diminishes. The ranch owner then encounters the problem of clearing his pastures anew at much expense of labor and time or of selling the more fertile lands in small areas to the truck farmers who are now finding in south Texas a field of very remunerative labor. The warmth of the early spring months enables them to market their products while prices are still very high. This movement toward more intensive agriculture in south Texas is carrying with it the building of railroads and the construction of extensive facilities for irrigation. In the Kingsville and Falfurrias districts water is being developed by artesian wells; in the Rio Grande Valley by pumping from the river.

South Texas was occupied until recently by a few cattle ranches, larger than many counties of our Northern States and managed in truly feudal fashion by widely scattered communities of Spanish-speaking retainers. Formerly there was no welcome for the crop-raising farmer, but now buyers of small tracts are in demand. South Texas is being rushed under the plow to escape the invasion of bushes. Large tracts which could have been bought a few years ago for a dollar or less per acre and could then have been put under cultivation without other expense than the plowing and sowing, now cost \$5 or \$10 an acre to clear of woody growth, in addition to the greatly increased prices of the land itself. But in the region to the north of Brownsville many thousands of acres are already lost, at least to the present generation, for the bushes are so well entrenched that the cost of clearing would greatly exceed the value of the land.

This shrubby vegetation which is threatening the cattle industry and opening south Texas to the truck and cotton farmers will undoubtedly continue to advance and multiply wherever the land is not cleared and cultivated. The south Texas farmer of the future instead of being a cattle king may even find himself without a place to pasture his milch cows except in his tilled fields.

The botanical explorers who have associated the South Texas region with the deserts farther to the west because they found it occupied by the same desert types of vegetation must revise their conclusions in the light of facts already accomplished and of others not long to be delayed. The mesquites, cacti, chaparral, and sagebrush are only an episode of the bionomic history of the region, not its original or normal condition or an index of its agricultural possibilities. They are merely the forerunners of the larger forest growth. If reforestation were to continue uninterrupted by fires or other forms of human interference the Gulf plains of Texas would again become covered with dense subtropical forests, and with the then impeded drainage would form vast swamps, such as doubtless existed before the advent of agricultural man, as shown by the now isolated remnants of the earlier forests.<sup>a</sup>

The primitive Indian agriculture which accomplished the devastation of this region as of many others in Mexico and Central America was here, as elsewhere, a self-limiting process. Lands once cleared and abandoned were kept by the fires from becoming reforested until the forests were all gone. That age of primitive agriculture ended in an age of grass and prairie fires, of wandering buffaloes, and nomadic hunters.

European settlers brought in the age of cattle, of diminishing quantities of grass, of weaker fires and advancing bushes, the pioneers of a new conquest by the forests. But the forests and swamps will not be permitted to return, for south Texas is being plowed and planted. A new chapter in the history of agricultural development is being opened. The age of farms, wells, canals, and railroads is at hand. Towns and cities are springing up, confident of a future of prosperity based on the immense fertility of this most recent extension of the already vast agricultural empire of Texas.

Though the long summer seasons are more truly tropical than many regions which lie within the Torrid Zone, it should not be supposed that south Texas is hotter in the summer or less comfortable to live in than the other parts of the State. The daily breezes from the Gulf moderate the extremes of heat and humidity often encountered farther north.

The climate of the southern coast belt also differs notably from that of the drier interior behind it, where true desert conditions prevail, suited to the date palm, like parts of Arizona and southern California. Date palms thrive and ripen their fruits at Laredo, Rio

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<sup>a</sup> The Texas palmetto (*Liodes texana*), which now seems to be closely confined to the banks of the lower Rio Grande, appears to have extended formerly over two hundred miles farther north. Tall palmettos were seen in Jackson County as late as 1876 by Mr. J. D. Mitchell, of Victoria.



Grande City, and Falfurrias, and may become one of the agricultural resources of the intervening region. The warmer spring season of south Texas enables the palms to flower earlier than in southeastern California, which compensates for lower temperatures later in the season.

The same qualities of soil which have produced desert conditions by making the land relatively impervious to water while uncultivated now render it extremely retentive of moisture under tillage. The sand which has drifted in from the Gulf and covered extensive tracts in the region south of Kingsville and Falfurrias often serves the useful purpose of a mulch. The rain is absorbed and has time to soak into the tenacious subsoil, and is there preserved from evaporation. The presence of small, delicate types of soil-inhabiting animals (scolopendrella, campodea, japyx, etc.) shows that these more sandy prairies of south Texas are able to retain permanent supplies of moisture instead of being subject to the complete drying out which precludes the existence of such creatures in many of the more northern parts of the State.

The effect of tillage on the retention of moisture in the soil is also shown sometimes in a very striking manner. Digging in the undisturbed soil of the prairie under the grass or among the desert shrubs may find the soil dry and hard, with no evidence of moisture within the range of the roots of crops. A few rods away where land of the same kind has been cleared and tilled, digging shows a loam-like subsoil, darkened with moisture that can almost be squeezed out with the hand, though no rain may have fallen for many weeks.

It may be that in south Texas dry farming will be reduced eventually to an exact system, for it will be possible with modern scientific appliances to measure the water in the ground almost as accurately as if it were stored in tanks or reservoirs. The farmer can withhold his seed till he has water enough and may become less dependent upon the vicissitudes of the weather than in regions where soils are less retentive and plants must have rain during the growing season. Excellent crops, especially of cotton, are often raised in south Texas from this earth-stored moisture alone without any rain or irrigation during the growing season. The dryness of the air and of the surface soil precludes serious injury from the boll weevil, giving this region an important advantage over the more humid parts of the cotton belt.

Land-hungry thousands who have not been satisfied in Oklahoma, Kansas, or the Dakotas are now hearing of the attractions of south Texas, and are arriving by trainloads to spy out the land. Unfortunate speculations and "booms" and many individual losses and disappointments will doubtless mark the history of this as of other newly occupied regions of the West, but the fact will remain that

there is fertile soil and that crops of many kinds can be raised, in winter as well as in summer, whenever there is water enough to enable them to grow to maturity.

Approved:

JAMES WILSON,

*Secretary of Agriculture.*

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